WHAT IS CLAIMED IS:

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1. An illumination system, ~~particularly~~ for microlithography with wavelengths ≤ 193 nm, comprising:

a primary light source;

a first optical component;

a second optical component;

an image plane; and

an exit pupil,

wherein said first optical component transforms said primary light source into a plurality of secondary light sources that are imaged by said second optical component in said exit pupil,

wherein said first optical component includes a first optical element having a plurality of first raster elements that are imaged into said image plane, producing a plurality of images being superimposed, at least partially, on a field in said image plane,

wherein said plurality of first raster elements deflect a plurality of incoming ray bundles to produce a plurality of deflected ray bundles with first deflection angles, and

wherein at least two of said first deflection angles are different from one another.

2. The illumination system according to claim 1,

wherein said plurality of incoming ray bundles has a plurality of incoming centroid rays,

wherein said plurality of deflected ray bundles has a plurality of deflected centroid rays,

wherein each one of said plurality of deflected centroid rays corresponds to one of said plurality of incoming centroid rays thus defining a plurality of planes of incidence, and

wherein at least two of said plurality of planes of incidence intersect each other.

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3. The illumination system according to claim 1, wherein each of said plurality of first raster elements corresponds to one of said plurality of secondary light sources, and wherein each of said plurality of first raster elements deflects one of said plurality of incoming ray bundles to said corresponding one of said plurality of secondary light sources.

4. The illumination system according to claim 1, wherein said plurality of first raster elements are mirrors being tilted to generate said first deflection angles.

5. The illumination system according to claim 1, wherein said plurality of first raster elements are lenses comprising a prismatic optical power to generate said first deflection angles.

6. The illumination system according to claim 1, wherein said first optical component comprises a collector unit for collecting a plurality of rays generated by said primary light source and for directing said plurality of rays to said first optical element.

7. The illumination system according to claim 6, wherein said collector unit has positive optical power to generate an intermediate image of said primary light source between said collector unit and said first optical element.

8. The illumination system according to claim 6, wherein said collector unit has positive optical power to generate a converging ray bundle between said collector unit and said first optical element.

9. The illumination system according to claim 8, further comprising:

a collector object plane of said collector unit in which said primary light source is located;

a collector image plane conjugated to said collector object plane;

an image-side principal plane of said collector unit;

a first optical distance between said image-side principal plane and said collector image plane;

a second optical distance between said image-side principal plane and said first optical element; and

a third optical distance between said first optical element and a plane with said secondary light sources,

wherein said first optical distance is approximately a sum of said second and third optical distances.

10. The illumination system according to claim 1, wherein said plurality of first raster elements are plane mirrors.

11. The illumination system according to claim 1, wherein said plurality of first raster elements are prisms.

12. The illumination system according to claim 1, wherein said plurality of first raster elements are concave mirrors.

13. The illumination system according to claim 1, wherein said plurality of first raster elements are convex mirrors.

14. The illumination system according to claim 1, wherein said plurality of first raster elements are lenses having a positive optical power.

15. The illumination system according to claim 1, wherein said plurality of first raster elements are lenses having a negative optical power.

16. The illumination system according to claim 1,

wherein said plurality of first raster elements are arranged in a plurality of rows,

wherein each of said plurality of rows includes at least one of said plurality of first raster elements, and

wherein at least one of said plurality of rows is displaced relative to an adjacent row.

17. The illumination system according to claim 1,

wherein said plurality of first raster elements are arranged in a two-dimensional array having an area being illuminated, and

wherein 90% of said plurality of first raster elements are arranged completely inside said area.

18. The illumination system according to claim 1,

wherein said first optical component further comprises a second optical element having a plurality of second raster elements,

wherein one of said plurality of first raster elements corresponds to one of said plurality of second raster elements, and

wherein said one of said plurality of first raster element deflects one of said plurality of incoming ray bundles to said corresponding one of said plurality of second raster elements.

19. The illumination system according to claim 18, wherein said plurality of second raster elements are located at a distance from said plurality of secondary light sources ranging from 0% to 10% of a distance between said plurality of first raster elements and said plurality of second raster elements.

20. The illumination system according to claim 18, wherein said plurality of second raster elements and said second optical component image said corresponding first raster elements into said image plane.

21. The illumination system according to claim 18, wherein said plurality of second raster elements are concave mirrors.

22. The illumination system according to claim 18, wherein said plurality of second raster elements are lenses with positive optical power.

23. The illumination system according to claim 18, wherein said plurality of second raster elements deflects said plurality of incoming ray bundles with second deflection angles to superimpose said plurality of images, at least partially, on said field.

24. The illumination system according to claim 23, wherein at least two of said second deflection angles are different from one another.

25. The illumination system according to claim 23, wherein said plurality of second raster elements are tilted planar mirrors.

26. The illumination system according to claim 23, wherein said plurality of second raster elements are tilted concave mirrors.

27. The illumination system according to claim 23, wherein said plurality of second raster elements are prisms.

28. The illumination system according to claim 23, wherein said plurality of second raster elements are lenses having a prismatic optical power and a positive optical power.

29. The illumination system according to claim 18, wherein at least two of said plurality of first raster elements are adjacent to one another and have two corresponding second raster elements, and wherein at least another one of said plurality of second raster elements is arranged between said two corresponding second raster elements.

30. The illumination system according to claim 18, wherein a distance between individuals of said plurality of second raster elements is irregular.

31. The illumination system according to claim 18,

wherein said plurality of first raster elements are arranged in a first two-dimensional array,

wherein said plurality of second raster elements are arranged in a second two-dimensional array,

wherein said first array has a first extent in a direction,

wherein said second array has a second extent in said direction, and

wherein said first and second extents are equal within a range of ± 15 %.

32. The illumination system according to claim 1, further comprising a masking unit for changing an illumination mode, wherein said masking unit is arranged at said plurality of secondary light sources.

33. The illumination system according to claim 1, wherein said field is a segment of an annulus.

34. The illumination system according to claim 1, wherein said plurality of first raster elements are rectangular.

35. The illumination system according to claim 34, wherein said rectangular first raster elements have an aspect ratio greater than 5 : 1.

36. The illumination system according to claim 33, wherein said second optical component comprises a first field mirror for shaping said field to said segment of said annulus.

37. Illumination system, ~~particularly~~ for microlithography with wavelengths ≤ 193 nm, comprising:

a primary light source;

a first optical component;

a second optical component;

an image plane; and

an exit pupil,

wherein said first optical component transforms said primary light source into a plurality of secondary light sources that are imaged by said second optical component in said exit pupil,

wherein said first optical component includes a first optical element having a plurality of first raster elements that are imaged into said image plane, producing a plurality of images being superimposed at least partially, on a field in said image plane,

wherein said plurality of first raster elements are rectangular,

wherein said field is a segment of an annulus, and

wherein said second optical component includes a first field mirror for shaping said field to said segment of said annulus.

38. The illumination system according to claim 37, wherein said first field mirror has negative optical power.

39. The illumination system according to claim 37, wherein said first field mirror is an off-axis segment of a rotational symmetric reflective surface.

40. The illumination system according to claim 37, wherein said first field mirror is an on-axis segment of a toroidal reflective surface.

41. The illumination system according to claim 37, wherein each of a plurality of rays intersects said first field mirror with an incidence angle of greater than 70°.

42. The illumination system according to claim 37, wherein said second optical component comprises a second field mirror with positive optical power.

43. The illumination system according to claim 42, wherein said second field mirror is an off-axis segment of a rotational symmetric reflective surface.

44. The illumination system according to claim 42, wherein said second field mirror is an on-axis segment of a toroidal reflective surface.

45. The illumination system according to claim 42, wherein each of a plurality of rays intersects said second field mirror with an incidence angle of less than 25°.

46. The illumination system according to claim 42, wherein said second optical component comprises a third field mirror.

47. The illumination system according to claim 46, wherein said third field mirror has negative optical power.

48. The illumination system according to claim 47, wherein said first, second and third field mirrors form (a) a telescope objective with a tele-object plane at said plurality of secondary light sources, (b) a tele-pupil plane at said image plane of said illumination system, and (c) a tele-image plane at said exit pupil.

49. The illumination system according to claim 46, wherein said third field mirror has positive optical power.

50. The illumination system according to claim 49,

wherein said third field mirror images said plurality of secondary light sources in a plane between said third field mirror and said second field mirror forming a plurality of tertiary light sources, and

wherein said second field mirror and said first field mirror images said plurality of tertiary light sources in said exit pupil.

51. The illumination system according to claim 50, further comprising a masking unit for changing an illumination mode, wherein said masking unit is arranged at said plurality of tertiary light sources.

52. The illumination system according to claim 46, wherein said third field mirror is an off-axis segment of a rotational symmetric reflective surface.

53. The illumination system according to claim 46, wherein said third field mirror is an on-axis segment of a toroidal reflective surface.

54. The illumination system according to claim 46, wherein each of a plurality of rays intersects said third field mirror with an incidence angle of less than 25°.

55. The illumination system according to claim 46, wherein said first, second and third field mirrors form a non-centered system.

56. The illumination system according to claim 1,
wherein said light source produces a beam cone oriented in a first direction,
wherein said image plane has a surface normal that is substantially perpendicular to said first direction,
wherein said first optical component comprises at least one first mirror, and
wherein said second optical component comprises at least one second mirror,
said illumination system having a beam path between said primary light source and said image plane that is bent with said at least one first mirror and said at least one second mirror.

57. The illumination system according to claim 1,
wherein said first optical component comprises a collector unit and a second optical element having a plurality of second raster elements,
said illumination system further comprising:
a first beam path between said collector unit and said first optical element, wherein said first optical element is reflective;
a second beam path between said first optical element and said second optical element, wherein said second optical element is reflective; and
a third beam path between said second optical element and said second optical component,
wherein said first and second optical elements are tilted to cause a crossing of said third beam path and said first beam path.

58. The illumination system according to claim 1, further comprising:
a straight line from a center of said field in said image plane to a center of said exit pupil; and
an angle between said straight line and a surface normal of said image plane,
wherein said angle is between 3° and 10°.

59. The illumination system according to claim 1,

wherein said first optical component and said second optical component comprise only mirrors, and

wherein each of a plurality of rays intersects said mirrors with incidence angles of greater than 65° or less than 25°.

60. The illumination system according to claim 1, wherein said second optical component comprises an even number of normal incidence mirrors having incidence angles of less than 25°.

61. The illumination system according to claim 1, wherein said first optical element is arranged in a divergent beam path.

62. The illumination system according to claim 1, wherein said first optical element is arranged in a convergent beam path.

63. A projection exposure apparatus for microlithography comprising:

the illumination system of claim 1;

a reticle being located at said image plane;

a light-sensitive object on a support system; and

a projection objective to image said reticle onto said light-sensitive object.

64. The projection exposure apparatus of claim 63, further comprising:

an illumination beam path between said primary light source and said reticle that passes through said first optical component and said second optical component; and

a projection beam path between said reticle and said light-sensitive object that passes through said projection objective,

wherein said illumination beam path and said projection beam path do not cross.

65. The projection exposure apparatus of claim 63, further comprising:

a projection beam path between said reticle and a first imaging element of said projection objective,

wherein said reticle is reflective, and

wherein said projection beam path converges towards an optical axis of said projection objective.